

Periprocedural anticoagulation management for thoracentesis, pleural biopsy, and needle aspiration biopsy

울산의대 서울아산병원 호흡기내과 최명근

호흡기계 시술 전후 항응고제 가이드라인 Part 3

- Thoracentesis, pleural biopsy, and needle aspiration biopsy

- 파트위원장

- 박진경 교수님 (강동경희대병원)



- 파트간사

- 최명근 (서울아산병원)



- 논문위원

- 이환진 교수님 (전북대병원)



- 위원

- 최연석 교수님 (경희의료원)
- 김민지 교수님 (서울아산병원)



Background

- Increasing numbers of patients undergo these procedures while receiving
 - Anticoagulants (warfarin, DOACs, heparins)
 - Antiplatelet agents (aspirin, P2Y12 inhibitors)
- Clinicians must balance:
 - Bleeding risk during the procedure
 - Thromboembolic risk associated with drug interruption

Background

- Current guidelines
 - 2019 SIR statements



STANDARDS OF PRACTICE

Society of Interventional Radiology Consensus Guidelines for the Periprocedural Management of Thrombotic and Bleeding Risk in Patients Undergoing Percutaneous Image-Guided Interventions—Part II: Recommendations

Endorsed by the Canadian Association for Interventional Radiology and the Cardiovascular and Interventional Radiological Society of Europe
Indravadan J. Patel, MD, Shiraz Rahim, MD, Jon C. Davidson, MD, Sue E. Hanks, MD,
Alda L. Tam, MD, T. Gregory Walker, MD, Luke R. Wilkins, MD, Ravi Sarode, MD, and
Ido Weinberg, MD

Table 3. Procedure-Associated Bleeding Risk Categorization (4,32–38)

Screening Coagulation Laboratory Test	Procedures
Low bleeding risk	
PT/INR: not routinely recommended*	Catheter exchanges (gastrostomy, biliary, nephrostomy, abscess, including gastrostomy/gastrojejunostomy conversions)
Platelet count/hemoglobin: not routinely recommended	Diagnostic arteriography and arterial interventions: peripheral, sheath < 6 F, embolotherapy [†]
Thresholds [‡]	Diagnostic venography and select venous interventions: pelvis and extremities
INR: correct to within range of ≤ 2.0–3.0 [‡]	Dialysis access interventions
Platelets: transfuse if < 20 × 10 ⁹ /L	Facet joint injections and medial branch nerve blocks (thoracic and lumbar spine) [§]
	IVC filter placement and removal [‡]
	Lumbar puncture [§]
	Nontunneled chest tube placement for pleural effusion
	Nontunneled venous access and removal (including PICC placement)
	Paracentesis
	Peripheral nerve blocks, joint, and musculoskeletal injections [§]
	Sacroiliac joint injection and sacral lateral branch blocks [§]
	Superficial abscess drainage or biopsy (palpable lesion, lymph node, soft tissue, breast, thyroid, superficial bone, eg, extremities and bone marrow aspiration)
	Thoracentesis
	Transjugular liver biopsy [§]
	Trigger point injections including piriformis [§]
	Tunneled drainage catheter placement [‡]
	Tunneled venous catheter placement/removal (including ports) [‡]

Table 3. Procedure-Associated Bleeding Risk Categorization (4,32–38) (continued)

Screening Coagulation Laboratory Test	Procedures
High bleeding risk	
PT/INR: routinely recommended	Ablations: solid organs, bone, soft tissue, lung
Platelet count/hemoglobin: routinely recommended	Arterial interventions: > 7-F sheath, aortic, pelvic, mesenteric, CNS ^{‡,§}
Thresholds [‡]	Biliary interventions (including cholecystostomy tube placement)
INR: correct to within range of ≤ 1.5–1.8	Catheter directed thrombolysis (DVT, PE, portal vein) ^{**}
Platelets: transfuse if < 50 × 10 ⁹ /L	Deep abscess drainage (eg, lung parenchyma, abdominal, pelvic, retroperitoneal)
	Deep nonorgan biopsies (eg, spine, soft tissue in intraabdominal, retroperitoneal, pelvic compartments)
	Gastrostomy/gastrojejunostomy placement
	IVC filter removal complex ^{**}
	Portal vein interventions
	Solid organ biopsies
	Spine procedures with risk of spinal or epidural hematoma (eg, kyphoplasty, vertebroplasty, epidural injections, facet blocks cervical spine) [§]
	Transjugular intrahepatic portosystemic shunt ^{††}
	Urinary tract interventions (including nephrostomy tube placement, ureteral dilation, stone removal)
	Venous interventions: intrathoracic and CNS interventions

Background

- Current guidelines
 - 2019 SIR statements



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Table 6. Management Recommendations for Anticoagulant and Antiplatelet Agents (32–34,36,110–128)

Medication	Low Risk for Bleeding	High Risk for Bleeding*
Anticoagulants		
UFH		
Withholding	Do not withhold	Withhold IV heparin for 4–6 h before procedure; check aPTT or anti-Xa level; for BID or TID dosing of SC heparin, procedure may be performed 6 h after last dose
Reinitiation	NA	6–8 h
LMWH: enoxaparin (Lovenox), dalteparin (Fragmin)		
Withholding	Do not withhold	Enoxaparin, withhold 1 dose if prophylactic dose is used; withhold 2 doses or 24 h before procedure if therapeutic dose is used; check anti-Xa level if renal function impaired; dalteparin, withhold 1 dose before procedure
Reinitiation	NA	12 h
continued		
Medication		
Low Risk for Bleeding		
High Risk for Bleeding*		
Fondaparinux (Arixtra)		
Withholding	Do not withhold	Withhold 2/3 d (CrCl ≥ 50 mL/min) or 3–5 d (CrCl ≤ 50 mL/min)
Reinitiation	NA	24 h
Argatroban (Acova)		
Withholding	Do not withhold	Withhold 2–4 h before procedure [†] ; check aPTT
Reinitiation	NA	4–6 h
Bivalirudin (Angiomax)		
Withholding	Do not withhold	Withhold 2–4 h before procedure [†] ; check aPTT
Reinitiation	NA	4–6 h
Warfarin (Coumadin)		
Withholding	Target INR ≤ 3.0 [†] ; consider bridging for high thrombosis risk cases	Withhold 5 d until target INR ≤ 1.8; consider bridging for high thrombosis risk cases; if STAT or emergent, use reversal agent
Reinitiation	NA or same-day reinitiation for bridged patients	Resume day after procedure; high thrombosis risk cases may benefit from bridging with LMWH and multidisciplinary management especially if reversal agent used along with vitamin K
Apixaban (Eliquis)		
Withholding	Do not withhold [‡]	Withhold 4 doses (CrCl ≥ 50 mL/min) or 6 doses (CrCl < 30–50 mL/min); if procedure is STAT or emergent, use reversal agent (andexanet alfa); consider checking anti-Xa activity or apixaban level especially with impaired renal function
Reinitiation	NA	24 h
Betrixaban (Bevyxxa)		
Withholding	Do not withhold [‡]	Withhold for 3 doses (113); if procedure is STAT or emergent, use reversal agent (andexanet alfa); consider checking anti-Xa activity especially with impaired renal function
Reinitiation	NA	24 h
Dabigatran (Pradaxa)		
Withholding	Do not withhold [‡]	Withhold 4 doses (CrCl ≥ 50 mL/min) or 6–8 doses (CrCl < 30–50 mL/min); if procedure is STAT or emergent, use reversal agent (idarucizumab); consider checking thrombin time or dabigatran level with impaired renal function
Reinitiation	NA	24 h
Edoxaban (Savaysa)		
Withholding	Do not withhold [‡]	Withhold for 2 doses; if procedure is STAT or emergent, use reversal agent (andexanet alfa); consider checking anti-Xa activity especially with impaired renal function
Reinitiation	NA	24 h
Rivaroxaban (Xarelto)		
Withholding	Do not withhold [‡]	Defer procedure until off medication for 2 doses (CrCl ≥ 50 mL/min), 3 doses (CrCl < 30–50 mL/min), or 3 doses (CrCl < 15–30 mL/min); if procedure is STAT or emergent, use reversal agent (andexanet alfa); consider checking anti-Xa activity or rivaroxaban level especially with impaired renal function
Reinitiation	NA	24 h

Background

- Current guidelines
 - 2019 SIR statements
 - Broad recommendations across image-guided procedures
 - Primarily based on expert consensus and indirect evidence
 - Guidance largely pharmacokinetic-based
 - No pooled estimates of bleeding risk

Background

- Current guidelines
 - 2010 BTS pleural disease guideline
 - Expert-based recommendations
 - Limited data on anticoagulant management

BTS guidelines

Pleural procedures and thoracic ultrasound: British Thoracic Society pleural disease guideline 2010

Tom Havelock,¹ Richard Teoh,² Diane Laws,³ Fergus Gleeson,⁴ on behalf of the BTS Pleural Disease Guideline Group

Clotting disorders and anticoagulation

- ▶ **Non-urgent pleural aspirations and chest drain insertions should be avoided in anticoagulated patients until international normalised ratio (INR) <1.5. (C)**

Patients known to be receiving anticoagulants or in whom there is a suspected coagulopathy (eg, liver failure) should have their prothrombin time (PT) or international normalised ratio (INR) measured prior to a non-urgent pleural procedure. In the case of a tension pneumothorax, it may be necessary to insert a drain first before correcting an abnormal INR. McVay *et al*⁷ retrospectively reviewed 608 cases undergoing paracentesis or pleural aspiration and found that mild coagulopathy, defined as an INR <1.5 or platelet counts 50–99 10⁹/l, did not adversely affect the risk of bleeding with a fall in haemoglobin of 2 g/dl occurring in only 3.1% and 0.2% requiring transfusion.

If a patient has abnormal coagulation and requires an invasive pleural procedure, the advice of the local haematologist should be sought regarding the correct action needed to normalise the clotting.

Part 3. PICO questions

Q1. In patients undergoing **thoracentesis**, does temporary interruption of anticoagulant therapy, compared with continuation, affect the risk of **bleeding or thromboembolic events**?

Q2. In patients undergoing **pleural biopsy**, does temporary interruption of anticoagulant therapy, compared with continuation, affect the risk of **bleeding or thromboembolic events**?

Q3. In patients undergoing **needle aspiration biopsy**, does temporary interruption of anticoagulant therapy, compared with continuation, affect the risk of **bleeding or thromboembolic events**?

Part 3. PICO questions

항목	내용
P (Population)	Thoracentesis (Q1) or pleural biopsy (Q2) or needle aspiration biopsy (Q3) 를 시행받는 환자 중 항응고제 (anticoagulants)를 복용 중인 환자
I (Intervention)	시술 전 항응고제의 일시 중단(temporary interruption of anticoagulant therapy)
C (Comparison)	항응고제 지속 복용(continuation of anticoagulant therapy)
O (Outcome)	1차: 출혈 합병증(bleeding events, procedure-related bleeding) 2차: 혈전색전증(thromboembolic events)

체계적문헌검색

소장자료 전체검색(E-Journal/E-Book 제외)



홈 > 연구지원 > 서비스 > 체계적문헌검색

서비스안내

신청

신청내역

주요정보원

Systematic & Scoping Review Collaboration

서비스안내

□ 신청 목적

- 체계적문헌고찰 Systematic review
- 주제범위 문헌고찰 Scoping Review *관련정보원 클릭
- 임상진료지침 Practice Guideline
- 근거중심 업무개선활동(EBP)
- 기타 이에 준하는 연구활동

*개인적인 관심주제의 선행연구검색은 주제검색서비스로 신청하시기 바랍니다.

□ 신청 방법

- 서비스 신청서를 작성하여 신청메이지에 파일첨부(필수)

[체계적문헌검색서비스 신청서 다운로드](#) →

□ 제공 내용

- PubMed, Cochrane, Embase 등 Core DB의 전략 검색식
- 검색결과 서지정보를 수집한 Endnote 압축파일 : 중복 문헌 1차 스크리닝 후 제공 (Endnote 기능 활용-실제 확인 추천)



원문제공

EndNote

교육동영상

SCIE 저널

Impact Factor

FAQ

My Menu

Part 3: Thoracentesis, pleural biopsy, and needle aspiration biopsy

	임상 질문 구조화/설명
Patient/Population/Problem (연구대상/문제)	Patients receiving anticoagulants undergoing thoracentesis, pleural biopsy, needle aspiration biopsy
Intervention (치료법 : 중재)	Temporary interruption of DOAC prior to procedure
Comparison (비교 치료법)	Different interruption intervals (e.g., 24 h vs 48 h vs ≥ 72 h)
Outcome (결과)	procedure-related bleeding, major bleeding, thromboembolic events (recurrent VTE, ischemic stroke), Mortality

	키워드 (*영문 필수 / 국내문헌검색 요청 시 한글 추가 작성 필요)
*Patient/Population/Problem (연구대상/문제)	("thoracentesis"[Title/Abstract] OR "pleural aspiration"[Title/Abstract] OR "pleural catheter drainage"[Title/Abstract] OR "pleural percutaneous catheter drainage"[Title/Abstract] OR "pleural biopsy"[Title/Abstract] OR "pleura biopsy"[Title/Abstract] OR "pleural needle biopsy"[Title/Abstract] OR "medical thoracoscopy"[Title/Abstract] OR "pleuroscopy"[Title/Abstract] OR "transthoracic needle biopsy"[Title/Abstract] OR "transthoracic needle aspiration"[Title/Abstract] OR "percutaneous lung biopsy"[Title/Abstract] OR "percutaneous core needle biopsy"[Title/Abstract] OR "percutaneous core needle aspiration"[Title/Abstract] OR "lung needle biopsy"[Title/Abstract]) AND (humans[Mesh] AND adult[Mesh]) NOT (case reports OR editorial)
*Intervention (치료법 : 중재)	해당 없음.
Comparison (비교 치료법)	
Outcome (결과)	Hemorrhage OR bleeding OR haemorrhage OR hemothorax OR haemothorax
Key Article 핵심 참고문헌	Douketis, J.D., et al., Perioperative Management of Antithrombotic Therapy: An American College of Chest Physicians Clinical Practice Guideline. Chest, 2022. Youness, H.A., et al., Management of oral antiplatelet agents and anticoagulation therapy before bronchoscopy. J Thorac Dis, 2017. 9(Suppl 10): p. S1022-s1033.

Part 3: Thoracentesis, pleural biopsy, and needle aspiration biopsy

No.	Search Query
#1	"Thoracentesis"[Mesh]
#2	thoracentesis[TIAB] OR thoracenteses[TIAB] OR pleurocentesis[TIAB] OR pleurocenteses[TIAB] OR "chest aspiration"[TIAB] OR "pleural aspiration"[TIAB] OR thoracocentesis[TIAB] OR thoracocenteses[TIAB]
#3	#1 OR #2
#4	"Pleura"[Mesh] OR "Pleural Diseases"[Mesh]
#5	pleura[TIAB] OR pleural[TIAB] OR transthoracic[TIAB]
#6	"Drainage"[Mesh:NoExp] OR "Paracentesis"[Mesh:NoExp] OR "Biopsy, Needle"[Mesh]
#7	drainage[TIAB] OR paracentesis[TIAB] OR biopsy[TIAB] OR needle-biopsy[TIAB] OR needle-aspiration[TIAB]
#8	(#4 OR #5) AND (#6 OR #7)
#9	"Thoracoscopy"[Mesh]
#10	thoroscop*[TIAB] OR pleural-endoscop*[TIAB] OR pleuroscop*[TIAB]
#11	#9 OR #10
#12	"Respiratory Tract Diseases"[Mesh] OR "Respiratory System"[Mesh]
#13	lung[TIAB]
#14	"Biopsy, Needle"[Mesh]
#15	biopsy[TIAB] OR needle-biopsy[TIAB] OR needle-aspiration[TIAB] OR "percutaneous biopsy"[TIAB:~3] OR "percutaneous needle"[TIAB:~3]
#16	(#12 OR #13) AND (#14 OR #15)
#17	#3 OR #8 OR #11 OR #16
#18	"Hemothorax"[Mesh]
#19	hemorrhag*[TIAB] OR haemorrhag*[TIAB] OR bleeding*[TIAB] OR hemothorax[TIAB] OR haemothorax[TIAB]
#20	#18 OR #19
#21	#17 AND #20
#22	#21 NOT (animals[Mesh:noexp] NOT (animals[Mesh:noexp] AND humans[Mesh]))
#23	#22 NOT ((("Child"[Mesh] OR "Infant"[Mesh] OR "Adolescent"[Mesh]) NOT ("Adult"[Mesh] AND ("Child"[Mesh] OR "Infant"[Mesh] OR "Adolescent"[Mesh])))
#24	#23 NOT (Editorial[PT] OR "Case Reports"[PT])

검색결과 및 중복제거 논문수	
DB별	검색 결과
PubMed	4,052
Embase	7,604
Cochrane Library	506
합계	12,162
Endnote 중복제거 논문 (Trash로 이동)	2,861
Endnote에 남아있는 검토대상 논문	9,301

Part 3: Thoracentesis, pleural biopsy, and needle aspiration biopsy

EndNote X9
File Edit References Groups Tools Window Help

AML260514_CMR_Thoracentesis Bleeding (Results) end

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All References (931)
Configure Sync...
Recently Added (0)
Unfiled (12)
Trash (2861)

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1. PubMed (1404)
2. Embase (7394)
3. Cochrane (503)

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Search Options

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Author Contains
Year Contains
Title Contains

Author	Year	Title
Zhou, Z.; Yu, L.; Zhe...	2026	Profiling of Potential Postmarket Risk Tracking and Pharmacovigilance Data for Avacopan
Zheng, Z.; Yang, M.; ...	2026	Transjugular liver biopsy in patients with unexplained liver dysfunction and bleeding tendency: a safety and efficacy analysis
Zheng, W. X.; Zhang...	2026	CT-guided iodocyanine green fluorescence localization demonstrates superior reliability over hook-wire for pulmonary ground-glass nodules: a retrospective cohort study
Zhao, R.; Xie, S.; Lian...	2026	Splenic rupture during secondary pleural decortication in a patient with rheumatoid arthritis: a case report
Zhang, Z.; Xiong, Y.; ...	2026	Iodized oil marking guided biopsy of hepatic space-occupying lesions under the protection of hepatic artery catheterization
Zhang, Y.; Zhang, M...	2026	Feasibility of Wedge Resection for Subpleural Hilar Lung Nodules Using CT-guided Hookwire Localization and Ultrasonic Dissection
Zhang, Y.; Xu, Y.; Do...	2026	Development and validation of a nomogram for predicting localization-related complications after CT-guided soft hook-wire placement for solitary pulmonary nodules
Zhang, X.; Stams, T. ...	2026	Comparison of fish-hook shaped and spiral shaped wires in CT-guided pulmonary nodule localization: Impact on complications and clinical outcomes
Zhang, X.; Li, H.; Li ...	2026	Minimally invasive esophagectomy and omental transposition for the treatment of refractory aortoesophageal fistula
Zhang, W.; Chen, G.; ...	2026	Endoscopic Classification of Severe Spontaneous Epistaxis: A Case-Series of 445 Patients
Zhang, Q.; Yu, J.; Zha...	2026	A refined diagnostic approach for interstitial lung disease: efficient and safe transbronchial cryobiopsy using a 1.1-mm cryoprobe
Zhang, J.; Wang, D.; ...	2026	Collision tumor of endometrial hepatoid adenocarcinoma and endometrial stromal sarcoma: a rare case and literature review
Zhang, H.	2026	Diagnostic value of mNGS in patients with suspected tumor: An observational study
Zeng, L.; Ruan, Z.; Ya...	2026	PD-1/ PD-L1 bispecific antibody IB1318 combined with levanitinib in advanced non-small cell lung cancer with acquired resistance to immune checkpoint inhibitors: a phase I
Yu, W.; Wang, J.; Zha...	2026	Chronic pancreatitis complicated by pancreatico-pleural fistula leading to black pleural effusion: a case report
Yu, H.; Ding, H.; Hua...	2026	From HBV to MASLD Cirrhosis: Mechanistic Insights and Therapeutic Strategies
You, Z.; Huang, J.; W...	2026	Dual-correction robotic bronchoscopy system with ultra-thin catheter for diagnosing challenging peripheral pulmonary nodules: A multi-centre prospective trial
You, H.; Ai, Q.; Wang...	2026	Ultrasound-guided trans-thoracic myocardial biopsy: the application of a new technology
Yoshimura, S.; Kana...	2026	Safety and Efficacy of CT-Guided Lung Biopsy in Elderly Patients age 75 Years and Older: A Single-Centre Retrospective Comparative Study
Yokota, Y.; Ohno, M...	2026	Small Intestinal Metastasis From Pulmonary Large Cell Carcinoma Detected by Capsule Endoscopy and Balloon-assisted Endoscopy, Followed by Early Surgical Resection: A C
Ying, G.; Kong, V.; Le...	2026	A 10-year review of penetrating subclavian artery injury at a major trauma center in South Africa
Yao, Q.; Zhao, Y.; Gu...	2026	Value of CT-guided coaxial percutaneous biopsy combined with radiofrequency ablation in the treatment of peripheral subsolid pulmonary nodules
Yang, S.; Hua, Z.; Ch...	2026	Machine learning predicts severe adverse events and salvage success of CT-guided lung biopsy after nondiagnostic transbronchial lung biopsy
Yang, H.; Luo, K. J.; L...	2026	Comparison of Two Dye Marking Methods for Preoperative Localization of Pulmonary Nodules Guided by Electromagnetic Navigation Bronchoscopy
Yadav, N.; Ansari, S. ...	2026	Diffuse Large B-Cell Lymphoma Beyond the Nodes: A Case Series of Rare Extranodal Presentations in the Nasopharynx, Breast and Central Nervous System
Xu, Z.; Gao, L.; Chen...	2026	Metagenomic next-generation sequencing for the diagnosis and evaluation of pediatric pleural effusion: a case series
Xu, S.; Ma, Y. D.; Bie...	2026	Preservation of cell-free RNA in percutaneous core-needle biopsy specimens' supernatants from non-small cell lung cancer improves genomic testing performance
Xu, D.; Liu, M.; Li, F. J...	2026	[Application of a novel robot-assisted navigation system in CT-guided percutaneous lung biopsy]
Wu, J.; Li, Z.; Yang, Z...	2026	Neoadjuvant ALK tyrosine kinase inhibitor in patients with resectable locally advanced non-small cell lung cancer harboring ALK rearrangement
Wu, C. W.; Yu, C. S.; ...	2026	A deep learning model based on ultrasound imaging to differentiate malignant from benign pleural effusion: a multicenter cohort study
Worm, M. S.; Meller, ...	2026	Drainage of Pleural Effusion in the Intensive Care Unit (DOPE-ICU) Feasibility Trial—Protocol and Statistical Analysis Plan
Worm, M. S.; Meller, ...	2026	Drainage of Pleural Effusion in the Intensive Care Unit (DOPE-ICU) Feasibility Trial—Protocol and Statistical Analysis Plan
Wei, Z.; Yang, X.; Ca...	2026	Percutaneous iodixanol localization of pulmonary ground-glass nodules for synchronous microwave ablation and biopsy: a multicenter, retrospective, matched analysis
Wattanachayakul, P...	2026	Clinical Outcomes of Patients Hospitalized for Conventional Pacemaker Implantation With Protein-Energy Malnutrition
Wang, X.; Ma, J.; She...	2026	Robotic-assisted bronchoscopy in dye localization in thoracoscopic pulmonary nodule resection: An initial experience
Wang, W.; Tan, Y.; X...	2026	ICG combined with medical adhesion in preoperative localization of complex pulmonary nodules: a retrospective study
Wang, J. F.; Jiang, L. ...	2026	Targeted Therapy-Induced Interstitial Lung Disease in NSCLC: Mechanisms, Clinical Signatures, and a Precision Medicine Roadmap

Part 3: Thoracentesis, pleural biopsy, and needle aspiration biopsy

The screenshot displays a reference management application with two main panes. The left pane shows a search results list, and the right pane shows the details of a selected article.

Search Results (Left Pane):

Author	Year	Title
Zhang, W.; Chen, G.; ...	2026	Endoscopic Classification of Seve
Zhang, Q.; Yu, J.; Zha...	2026	A refined diagnostic approach fo
Zhang, J.; Wang, D.; ...	2026	Collision tumor of endometrial he
Zhang, H.	2026	Diagnostic value of mNGS in pati
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Yu, W.; Wang, J.; Zha...	2026	Chronic pancreatitis complicated
Yu, H.; Ding, H.; Hua...	2026	From HBV to MASLD Cirrhosis: M
You, Z.; Huang, J.; W...	2026	Dual-correction robotic bronchos
You, H.; Ai, Q.; Wang...	2026	Ultrasound-guided trans-thoracic
Yoshimura, S.; Kanai, O...	2026	Safety and Efficacy of CT-Guided Lu
Yokota, Y.; Ohno, M.; ...	2026	Small Intestinal Metastasis From I
Ying, G.; Kong, V.; Le...	2026	A 10-year review of penetrating s
Yao, Q.; Zhao, Y.; Gu...	2026	Value of CT-guided coaxial perc
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Wei, Z.; Yang, X.; Ca...	2026	Percutaneous iodixanol localizati
Wattanachayakul, P.; ...	2026	Clinical Outcomes of Patients Ho
Wang, X.; Ma, J.; She...	2026	Robotic-assisted bronchoscopy ir
Wang, W.; Tan, Y.; X...	2026	ICG combined with medical adhe
Wang, J. F.; Jiang, L. ...	2026	Targeted Therapy-Induced Inters
Wang, G.; Ren, C. J.; ...	2026	CT-Guided Anchored Needle Vers
Wang, A.; Zhu, X.; H...	2026	Surgical technique and outcomes
Verma, M. K.; Sharm...	2026	Evaluation of Diagnostic Accurac
Upadrista, P. K.; Sab...	2026	Trapped Lung
Uemura, S.; Nakaoka...	2026	Thorascopic intercostal nerve t
Tyker, A.; Cruz, J.; S...	2026	Acquisition of endobronchial ultr
Tole, M. C.; Guevara...	2026	Unmasking Cytomegalovirus Celi
Thiboutot, J.; Kapp, ...	2026	Cryobiopsy vs Forceps for Bronch
Tharwat, M.; Baraka...	2026	Enhancing dromedary camel (Car
ter Rakko, B. M. A. ...	2026	Patient-Tailored Minimally Invasi

Article Details (Right Pane):

Reference Type: Journal Article

Rating:

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Part 3: Thoracentesis, pleural biopsy, and needle aspiration biopsy

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Abstract

Introduction: CT-guided biopsy has good diagnostic accuracy, but adverse events such as pneumothorax are common. There are few reports on the safety and efficacy of CT-guided biopsy in the elderly. **Methods:** This was a retrospective single-centre cohort study. Patients who underwent CT-guided lung biopsy between February 2017 and August 2024 were included. Patient background, disease background, examination status, and adverse events were ascertained. Elderly were defined as those aged 75 years and older. The primary outcome was the incidence of all adverse events, and the secondary outcomes were the incidence of pneumothorax and diagnostic accuracy. Categorical variables were compared by Chi-square test, and continuous variables by t-test. Multivariable analysis was performed by logistic regression analysis adjusted for age, sex, lung comorbidities, and radiological findings of target lesion. **Results:** There were significant differences between the two groups in ECOG-PS and the distance from the surface to pleura and target. In the primary outcome, any adverse events occurred in 207 patients (56.2%), with no significant difference between elderly (97/180, 53.9%) and non-elderly (110/188, 58.5%) patients ($p = 0.401$). Pneumothorax was the most common adverse event, occurring in 151 (41.0%) patients, with no significant difference between elderly (68/180, 37.8%) and non-elderly (83/188, 44.1%) ($p = 0.244$). On multivariate analysis, elderly (75 years or older) was not clearly associated with the occurrence of all or severe adverse events, pneumothorax, and confirmed diagnosis. Location in the lower lung field and distant from the pleura were significantly associated with the incidence of all adverse event. In the secondary outcomes, emphysema or interstitial pneumonia, location in the lower lung field, and distant from the pleura were significantly associated with pneumothorax. There was no significant difference in the diagnostic accuracy disease between the elderly and non-elderly patients. **Conclusions:** The incidence of adverse events and diagnostic accuracy of CT-guided biopsy are similar in elderly and non-elderly patients, and this method is useful even in elderly patients. **Key point:** The safety and efficacy of CT-guided lung biopsy in elderly patients are equivalent to those in non-elderly patients.

Notes

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Research Notes

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Author Address

K. Fujita, Division of Respiratory Medicine, Center for Respiratory Diseases, National Hospital Organization Kyoto Medical Center, 1-1 Fukakusa-Mukaihata-Cho, Fushimi-Ku, Kyoto, Japan.

Figure

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Layout

Screening

PRISMA Screening 결과 요약

단계	항목	건수
검색 결과	총 검색 결과 (중복 포함)	9301
1차 제외	2005년 이전 논문 제외	-1918
	2005년 이후 논문	7383
2차 제외	중복 논문 제외	-263
	중복 제거 후 스크리닝 대상	7120
3차 자동 제외	Case Report	-194
	Non-English	-723
	소아(Pediatric)	-236
	Surgical Biopsy / VATS	-1333
	Conference Abstract	-127
	Non-human	-111
	Review Article	-1023
	Traumatic Hemothorax 치료 목적 Thoracentesis	-93
	Thoracentesis/Pleural Biopsy/PCNB 무관	-6666
	최종 결과	포함 논문 (스크리닝 통과)
	Q1 Thoracentesis	127
	Q2 Pleural Biopsy	96
	Q3 PCNB	265

Screening (Q3: needle aspiration biopsy)

- Title and abstract screening (265 articles)
- Articles eligible for full-text review
 - 148 articles
- Excluded
 - Case reports/case series: 9
 - Learning curve or initial experience studies: 2
 - Non-human studies: 2
 - Studies not evaluating bleeding outcomes: 59
 - Studies not relevant to the research question: 36
 - Review articles: 7
 - Duplicate records: 2

Q3. In patients undergoing **needle aspiration biopsy**, does temporary interruption of anticoagulant therapy, compared with continuation, affect the risk of bleeding or thromboembolic events?

Screening (Q1 thoracentesis; Q2 pleural biopsy)

I. 적합한 문헌 (총 4개): 항응고제 투여 환자의 시술 전후 출혈 위험성 문헌

II. 보류 문헌 (총 11개)

1. 항혈소판제 투여 연구 : 4
2. 응고장애 지표 연구 : 5
3. 통계적 방법론 연구 : 2

III. 부적합 문헌 사유의 분류 (총 192 개)

1. 동물 실험 및 수의학적 모델 연구 : 5
2. Case Reports and Case Series : 9
3. 흉막 외 다른 장기 시술 및 개흉 수술 : 17
4. 내시경/초음파 기기의 성능검증 및 진단율 향상 : 56
5. 특정 질환의 흉수의 역학 및 생화학적 병태 생리 : 81
6. 흉막 유착술, 중재술 : 14
7. 중복 문헌 : 10

Q1. In patients undergoing **thoracentesis**, does temporary interruption of anticoagulant therapy, compared with continuation, affect the risk of bleeding or thromboembolic events?

Q2. In patients undergoing **pleural biopsy**, does temporary interruption of anticoagulant therapy, compared with continuation, affect the risk of bleeding or thromboembolic events?

Outcomes

- Primary outcomes
 - Any bleeding
 - Major bleeding
- Secondary outcomes
 - Minor bleeding
 - Hemothorax
 - Hemoptysis
 - Other site bleeding
 - Any VTE event
 - Deep vein thrombosis

Perioperative Management of Antithrombotic Therapy

An American College of Chest Physicians Clinical Practice Guideline

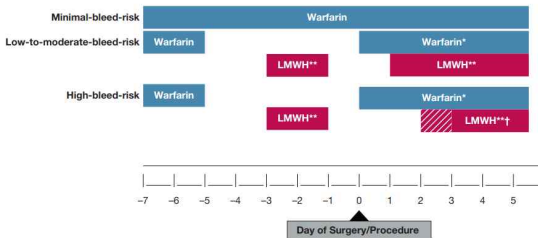


James D. Douketis, MD, FCCP; Alex C. Spyropoulos, MD, FCCP; M. Hassan Murad, MD, MPH; Juan I. Arcelus, MD; William E. Dager, PharmD; Andrew S. Dunn, MD, MPH; Ramiz A. Fargao, MD, FCCP; Jerrold H. Levy, MD; C. Marc Samama, MD; Sahnish H. Shah, MBBS; Matthew W. Sherwood, MD; Alfonso J. Tafur, MD; Liang V. Tang, MD; and Lisa K. Moores, MD, FCCP

TABLE 2 | Suggested Risk Stratification for Procedural Bleed Risk, Based on ISTH Guidance Statements²⁵

<p>High-bleed-risk surgery/procedure^a (30-d risk of major bleed \geq 2%)</p>	<p>Major surgery with extensive tissue injury Cancer surgery, especially solid tumor resection (lung, esophagus, gastric, colon, hepatobiliary, pancreatic) Major orthopedic surgery, including shoulder replacement surgery Reconstructive plastic surgery Major thoracic surgery Urologic or GI surgery, especially anastomosis surgery Transurethral prostate resection, bladder resection, or tumor ablation Nephrectomy, kidney biopsy Colonic polyp resection Bowel resection Percutaneous endoscopic gastrostomy placement, endoscopic retrograde cholangiopancreatography Surgery in highly vascular organs (kidneys, liver, spleen) Cardiac, intracranial, or spinal surgery Any major operation (procedure duration > 45 min) Neuraxial anesthesia^b Epidural injections</p>
<p>Low-to-moderate-bleed-risk surgery/procedure^c (30-d risk of major bleed 0%-2%)</p>	<p>Arthroscopy Cutaneous/lymph node biopsies Foot/hand surgery Coronary angiography^d GI endoscopy \pm biopsy Colonoscopy \pm biopsy Abdominal hysterectomy Laparoscopic cholecystectomy Abdominal hernia repair Hemorrhoidal surgery Bronchoscopy \pm biopsy</p>
<p>Minimal-bleed-risk surgery/procedure^e (30-d risk of major bleed approximately 0%)</p>	<p>Minor dermatologic procedures (excision of basal and squamous cell skin cancers, actinic keratoses, and premalignant or cancerous skin nevi) Ophthalmologic (cataract) procedures Minor dental procedures (dental extractions, restorations, prosthetics, endodontics), dental cleanings, fillings Pacemaker or cardioverter-defibrillator device implantation</p>

Part 3: Thoracentesis, pleural biopsy, and needle aspiration biopsy



Direct Oral Anticoagulant	Procedure Bleeding Risk	Pre-Procedure DOAC Interruption						Surgery/Procedure (Day 0)	Post-Procedure Resumption*			
		Day -6	Day -5	Day -4	Day -3	Day -2	Day -1		Day +1	Day +2	Day +3	Day +4
Apixaban	High											
	Low/Mod											
Dabigatran (CrCl ≥ 50 ml/min)	High											
	Low/Mod											
Dabigatran (CrCl < 50 ml/min)	High											
	Low/Mod											
Edoxaban	High											
	Low/Mod											
Rivaroxaban	High											
	Low/Mod											

Yellow box: No DOAC administered that day

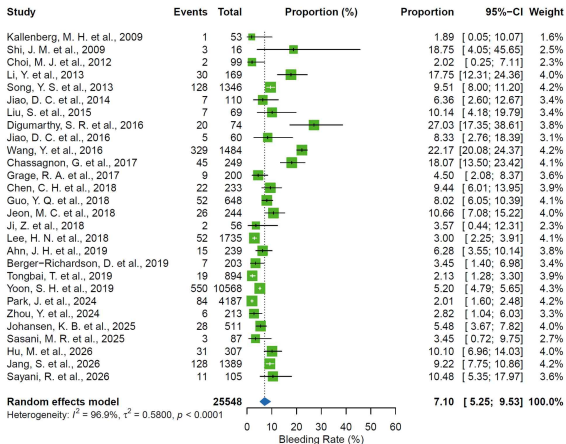
*DOAC can be resumed ~24 hours after low/moderate-bleed-risk procedures, and 48-72 hours after high-bleed-risk procedures. In selected patients at high risk for VTE, low-dose anticoagulants (i.e., enoxaparin, 40 mg daily or dalteparin, 5,000 IU daily) can be given for the first 48-72 hours post-procedure.

Figure 2 - Perioperative management of direct oral anticoagulants (DOACs). CrCl = creatinine clearance.

Preliminary results (Q3: needle aspiration biopsy)

Q3. In patients undergoing **needle aspiration biopsy**, does temporary interruption of anticoagulant therapy, compared with continuation, affect the risk of bleeding or thromboembolic events?

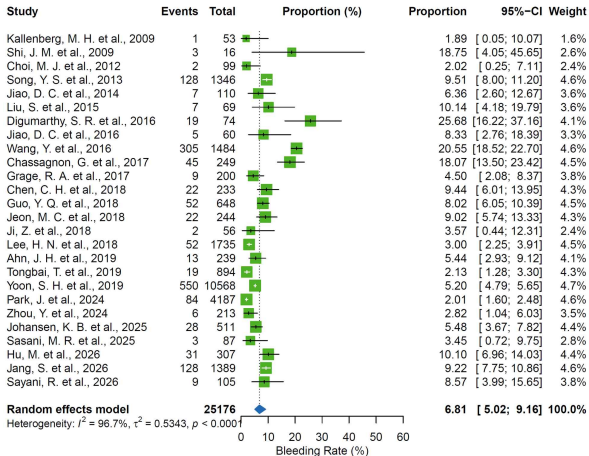
- Any bleeding
(영상의학적으로만 확인된 폐실질 출혈 제외)



Preliminary results (Q3: needle aspiration biopsy)

Q3. In patients undergoing **needle aspiration biopsy**, does temporary interruption of anticoagulant therapy, compared with continuation, affect the risk of bleeding or thromboembolic events?

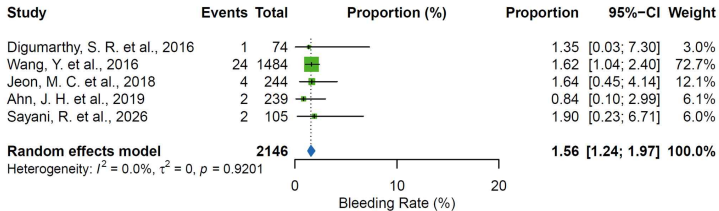
- Hemoptysis



Preliminary results (Q3: needle aspiration biopsy)

Q3. In patients undergoing **needle aspiration biopsy**, does temporary interruption of anticoagulant therapy, compared with continuation, affect the risk of bleeding or thromboembolic events?

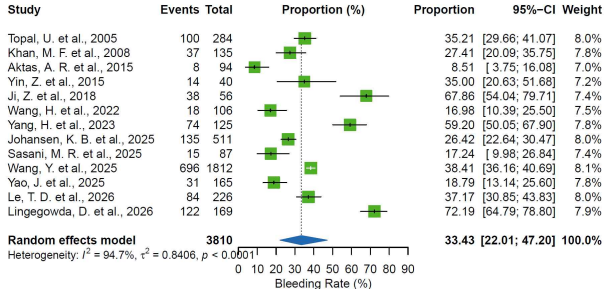
- Hemothorax



Preliminary results (Q3: needle aspiration biopsy)

Q3. In patients undergoing **needle aspiration biopsy**, does temporary interruption of anticoagulant therapy, compared with continuation, affect the risk of bleeding or thromboembolic events?

- Radiologically (CT) detected pulmonary hemorrhage



Next steps

- 포함시킬 문헌의 정의
 - Small cohort (<20 or 30)?
 - Since 2005?
 - Initial experience or learning curve studies?
 - Studies without bleeding or thrombosis endpoints (but with available data)
- Outcome 구체화
 - Major/minor bleeding definition
 - Radiologic hemorrhage?
 - anticoagulants/antiplatelet continuation or interruption?
- Screened articles의 전문 검토 및 데이터 추출
- endpoint 분석 및 subgroup 분석

- 가이드라인 (메타분석 및 이전 가이드라인에 근거한 지침 제시) 작성
- 논문 (meta-analysis and systematic review) 작성

Thank you